

CLAIM AMENDMENTS

1-12 (Cancelled)

13. (Currently Amended) A system for laser-beam guidance of a microtunnelling machine comprising:

a boring head having a forward wall formed with an aperture,

a boring bit forward of the forward wall of the boring head and rotatable relative to the boring head,

a hollow drive shaft coupled at a forward end thereof to the boring bit and extending rearward from the boring head through the forward wall of the boring head and a rearward end of the boring head, the aperture in the forward wall of the boring head permitting adjustment of the drive shaft relative to the boring head in two directions that are substantially perpendicular to each other and to a longitudinal axis of the boring head,

a liquid supply means for supplying water through the hollow drive shaft to the boring bit,

a slurry removal means for removing slurry made by the boring bit to a location rearward of the boring head,

a target for the laser beam attached to the drive shaft,

a means for acquiring an image of the target and the laser strike position thereon and for conveying the image to an operator station situated remotely from the boring head, and

an input means for ~~the operator to adjust~~ operational adjustment of the direction of the forward end of the drive shaft.

14. (Currently Amended) A microtunnelling machine comprising:

a boring head having a forward ~~end and a rearward end~~ wall formed with an aperture,

a boring bit ~~at the forward end~~ forward of the forward wall of the boring head and rotatable relative to the ~~boring head, the boring bit being adjustable relative to the boring head in two directions~~ that are substantially perpendicular to each other and to a longitudinal axis of the boring head,

~~a drive motor located to the rear of the boring head,~~

a hollow drive shaft coupled at a forward end thereof to the boring bit and extending rearward from the boring head through the forward wall of the boring head and a rearward end of the boring head,

~~the drive shaft being coupled at a rearward end to the drive motor for driving the boring bit to rotate relative to the boring head~~ the aperture in the forward wall of the boring head permitting adjustment of the drive shaft relative to the boring head in two directions that are substantially perpendicular to each other and to a longitudinal axis of the boring head,

a liquid supply means for supplying water through the hollow drive shaft to the boring bit,

a slurry removal means for removing slurry made by the boring bit to a location rearward of the boring head,

a target for a laser beam attached to the drive shaft at the forward end of the drive shaft,

a means for acquiring an image of the target and the laser strike position thereon and for conveying the image to an operator station situated remotely from the boring head, and

an input means ~~for at~~ the operator ~~to adjust~~ station for adjusting the direction of the forward end of the drive shaft.

15. (Currently Amended) A microtunnelling machine according to claim 14, comprising ~~an operator station located to the rear of the boring head, and wherein the drive motor is a drive motor~~ located at the operator station, and wherein the operator station includes said input means and a laser source for emitting said laser beam.

16. (Currently Amended) A microtunnelling machine according to claim 14, wherein ~~the drive shaft is hollow and the machine comprises a liquid supply means for supplying water to the boring bit through the drive shaft, and~~ the drive shaft is formed with outlet apertures for discharging water at a forward face of the boring bit.

17. (New) A microtunnelling machine according to claim 14, wherein the means for acquiring and conveying the image is a video camera.

18. (New) A microtunnelling machine according to claim 17, wherein the target is a surface against which the laser is visible in contrast.

19. (New) A microtunnelling machine according to claim 18, wherein the target has markings to help the operator to centre the direction of the boring bit.

20. (New) A microtunnelling machine according to claim 14, wherein the input means for the operator comprises switches for controlling adjusters which act on the drive shaft.

21. (New) A microtunnelling machine according to Claim 20, wherein the switches are grouped for joystick operation.

22. (New) A microtunnelling machine according to claim 20, wherein the adjusters are a pair of rams mutually disposed at an angle and connectable to a source of water pressure and to a water drain.

23. (New) A microtunnelling machine according to claim 22, wherein each ram has a water in port and a water out port and ram movement is initiated by connection of the out port to drain.

24. (New) A microtunnelling machine according to claim 14, wherein the boring head is 200-800mm in diameter.

25. (New) A microtunnelling machine according to claim 14, wherein the bore rate is 9-95 ft/hr.

26. (New) A microtunnelling machine according to claim 20, wherein the input means includes input signals from an imaging system which uses the camera image to compare the bore direction indicated by the target with the laser beam direction.

27. (New) A microtunnelling machine comprising:  
a boring head having a forward end and a rearward end,  
a boring bit at the forward end of the boring head and rotatable relative to the boring head, the boring bit being adjustable relative to the boring head in two directions that are substantially perpendicular to each other and to a longitudinal axis of the boring head,  
a drive motor located to the rear of the boring head,

a hollow drive shaft coupled at a forward end thereof to the boring bit and extending from the boring head through the rearward end of the boring head, the drive shaft being coupled at a rearward end to the drive motor for driving the boring bit to rotate relative to the boring head,

a liquid supply means for supplying water through the hollow drive shaft to the boring bit,

a slurry removal means for removing slurry made by the boring bit to a location rearward of the boring head,

a target for a laser beam attached to the drive shaft at the forward end of the drive shaft,

a means for acquiring an image of the target and the laser strike position thereon and for conveying the image to an operator station situated remotely from the boring head, and

an input means at the operator station for adjusting the direction of the forward end of the drive shaft.